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TECHNICAL ABSTRACTS

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LEAD DEVELOPMENT ASSOCIATION

18 ADAM STREET
LONDON, W.C.2
Telephone: WHITEHALL 4175
Telegrams: LEADEVEP · RAND · LONDON

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INTRODUCTION

The services of the Lead Development Association are freely available to all users and consumers of Lead and inquiries are invited on all matters relating to the metal. Its technical officers are fully qualified to discuss particular problems and will welcome opportunities of giving advice and guidance from their knowledge, backed by the information centred in the Association's Library.

With the object of giving publicity to current trends and developments it has been decided to issue quarterly a digest of recent technical literature and patents which have been noted as relevant, and this is the first issue. It is hoped that it will serve as a useful addition to L.D.A. publications.

BOOK BINDERY (M)

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PART I

TECHNICAL PAPERS

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ALLOYS

1 THE SURFACE TENSION OF THE BINARY ALLOYS Pb-Sn, Bi-Pb, Bi-Sn and Bi-Cd

R. V. Bakradze and B. Ya. Pines

Translation from Zh. Tekhn. Fiz. S.S.S.R. 1953, 23(9), 1948-1958
A.E.R.E. Lib/Trans. 727.

Determination of surface tension variations with concentration and temperature variations up to 550° C. Measurements both in vacuum by ring break-away method and in hydrogen atmosphere by maximum possible pressure method.

---

2 EFFECT OF SMALL ANTIMONY ADDITIONS ON RATE OF OXIDATION OF LEAD

W. Hartman, W. Hofmann and W. Stahl

Erzmetall, April, 1958, 11(4), 151-163.

Survey of Literature and investigations to fill gaps in same.

---

3 MECHANICAL PROPERTIES OF SHEET LEAD ALLOYS

E. Pelzel

Z. Metallkunde, Feb. 1958, 49(2), 102-110.

Alloys studied include:

Pb-Sb; Pb-Sb-As;
Pb-Sb-Sn; Pb-Sb-Bi;
Pb-Sb-Cu; Pb-Sb-Ni;
Pb-Sb-Te; Pb-Sb-Cd;
Pb-Sb-Sn-As;
Pb-Sb-As-Cu;
Pb-Sb-As-Ni;
Pb-Sb-As-Te.

(in German)

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4 INDIUM AS AN ANODE MATERIAL

T. L. Boswell

J. Electrochem. Soc., May 1958, 105(5), 239.

Includes indium lead alloys.

5 INTERMETALLIC COMPOUNDS BETWEEN LITHIUM AND LEAD — *A. Zalkin and W. J. Ramsey*

J. Phys. Chem., June 1958, 62(6), 689.

Discusses crystal structure of $Li_{22}Pb_5$.

ANALYSIS

6 METHODS FOR EMISSION SPECTROCHEMICAL ANALYSIS — *American Society for Testing Materials*

Book, Oct., 1957, 488 pp. ASTM, 1916 Race Street, Philadelphia 3, Pa. $7.

Revision of earlier book published 1953.
Includes 18 methods of analysis for lead, tin, zinc and related metals.

---

7 A MICRO PROCEDURE FOR THE ELECTROLYTIC DETERMINATION OF LEAD IN COPPER BASE ALLOYS — *H. J. C. Saint*

Analyst, Feb. 1958, 83 (983) 88-92.

Analyses of up to 5% Lead in copper based alloys using platinum wire anode. Manganese and arsenic interfere. 5 mg. samples.

---

8 PHOTOMETRIC DETERMINATION OF BERYLLIUM — *U. T. Hill*

Anal. Chem. Apl. 1958, 30 (4) 521-524.

Study of Eriochrome Cynanine B method for determination of berryllium in lead and other metals and alloys, without chemical separations.

---

9 DETERMINATION OF LEAD BY DITHIZONE IN A SINGLE PHASE WATER ACETONE SYSTEM — *D. G. M. Diaper and A. Kuksis*

Canad. J. Chem., Nov. 1957, 35 (11) 1278-1284.

Modification of standard colorimetric procedure for determination of lead using aqueous acetone, ethanol or methanol, to dissolve complexing salts and buffer.

BATTERIES

10 STATIONARY BATTERIES: LEAD-ACID PLANTE POSITIVE TYPE

British Standards Institution

British Standard 440:1958, 21 pages.
B.S.I., 2 Park Street, London, W.1.

---

11 SILVER, COBALT, AND POSITIVE-GRID CORROSION IN THE LEAD-ACID BATTERY

J. J. Lander

J. Electrochem. Soc., June 1958, 105(6), 289.

Tests showing the beneficial effects of additions of silver and cobalt to the electrolyte.

BEARINGS

12 THE POLAROGRAPHIC DETERMINATION OF LEAD IN TIN-BASE ALLOYS

M. Ariel and P. Enoch

Analyt. Chim. Acta, April 1958, 18(4), 265-269.

Rapid determination of lead in tin base bearing alloys.

CORROSION

13 CORROSION OF METALS AND PROTECTIVE METAL COATINGS IN INDUSTRIAL ATMOSPHERES

G. Schikorr

Schweizer Archiv., Feb. 1958, 24(2), 33-46.

Critical survey based on 78 references. Discusses atmospheric corrosion; protective films; characteristics of non-ferrous metals.

(in German)

14 CORROSION OF STEEL.
Part I: PROTECTIVE ACTION OF OXIDES ON LEAD AND ZINC
Part II: INHIBITIVE BEHAVIOUR OF CHROMATES, MOLYBDATES AND TUNGSTATES OF ZINC AND LEAD

A. C. Choudhury and S. C. Shome

J. Sci. Ind. Res. (A) (India), Jan. 1958, 17A(1), 30-34; 35-38.

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15 THE CORROSION OF LEAD BY BROMINE AND ITS PREVENTION

M. R. Bloch, D. Kaplam and J. Schnerb

J. Applied Chem., March 1958, 8(3), 171-174.

Corrosion is due to presence of HBr and can be prevented by addition of oxidising agents or by anodic oxidation of metal surface.

---

16 CORROSION CURRENT/pH DIAGRAM FOR LEAD IN DILUTE ELECTROLYTES

T. Marcovic and V. Bestvina

Werkstoffe und Korrosion, March 1958, 9(3), 152-154.

Dissolution rate of 99.99% lead in various acid and alkaline solutions.

(in German)

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17 ELECTRICAL MEASUREMENTS AND THEIR INTERPRETATION IN UNDERGROUND CABLE CORROSION PROBLEMS

K. G. Compton

Corrosion, May 1958, 14(5), 237t-244t.

Methods of surveying and measuring various parameters, with examples and interpretations.

---

18 CATHODIC PROTECTION OF LEAD CABLE SHEATH IN THE PRESENCE OF ALKALI FROM DEICING SALTS

W. H. Bruckner and W. W. Lichtenberger

Corrosion, April 1958, 14(4), 165t-170t.

Reliability of pourbaix diagram as a guide to the potential required for protection of lead sheathed cable under any pH conditions in service. Variations between theoretical and practical requirements discussed.

19 THE CORROSION OF LEAD BY DILUTE AQUEOUS ORGANIC ACIDS

E. L. Coles, J. G. Gibson and R M. Hinde

J. Applied Chem., May 8, 1958, 8(5), 341.

Tests and results on rate of corrosion in various organic acids.

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20 ELECTROCHEMICAL PROPERTIES OF PbO_2 AND THE ANODIC CORROSION OF LEAD AND LEAD ALLOYS

P. Ruetschi and B. D. Cahan

J. Electrochem. Soc., July 1958, 105(7), 369.

Electrochemical properties and oxygen content of various corrosion product layers.

CREEP AND FATIGUE

21 RECTANGULAR CRACKING IN LEAD

K. U. Snowden and J. N. Greenwood

Trans. A.I.M.E., Feb. 1958, 212(1), 91-92.

An attempt at clarification of some of the knowledge of rectangular pattern of intercrystalline cracks in lead caused by fluctuating stresses.

ELECTRICAL

22 THE SUITABILITY OF LEAD AS A STANDARD REFERENCE MATERIAL

W. B. Pearson and I. M. Templeton

Canad. J. Phys., May 1958, 36(5), 627.

Gives the resistivity of zone refined lead.

ELECTROLYSIS

23 ANODIC CORROSION OF METALS AND ALLOYS IN PYROPHOSPHATE SOLUTIONS — *T. L. Rama Char*

Corrosion Prevention & Control, Apl. 1958, 5(4), 37-38.

Behaviour of the various metal and alloy anodes in pyrophosphate bath. Includes lead and tin lead alloy anodes.

EQUIPMENT — GENERAL

24 DESIGN AND OPERATION OF AN EFFLUENT DISPOSAL SYSTEM — *J. C. Langford*

The Engineering Journal, June 1958, 41(6), 55.

Description of effluent disposal system at a Canadian factory.

LEAD — GENERAL

25 PAPERS PRESENTED AT 30th ANNUAL MEETING OF LEAD INDUSTRIES ASSOCIATION, ST. LOUIS, MISSOURI, APRIL, 1958 — *Lead Indust. Assoc. (U.S.A.)*

Typescript, L.I.A., 60 East 42nd St., New York 17.

Seven Papers covering Atomics, Ceramics, Health, Chemical Engineering, Cables, Statistics and Batteries.

METALLURGY

26 THE VALENCE STATE OF METALLIC LEAD — *W. B. Pearson*

Canad. J. Phys., May 1958, 36(5), 631.

27 SOME ASPECTS OF THE MORPHOLOGY AND CHEMISTRY OF LEAD IN LEADED HIGH SULPHUR STEELS — *J. W. Thurman*

Trans. A.S.M., 1958, 1, 208.

The conclusion is reached that most of the lead is present in elemental form.

---

28 DROSSING OF MOLTEN LEAD — *E. Pelzel and H. Schneider*

Metall, Feb. 1958, 12(2), 122-124.

The lower limit to the undesirable range of antimony contents, considered to be the cause of drossing in lead alloys, is discussed in the light of new experiments.

(in German)

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29 SOLUBILITY OF NICKEL AND CHROMIUM (ALSO MOLYBDENUM AND TUNGSTEN) — *T. Alden. D. A. Stevenson and J. Wulff*

Trans. A.I.M.E., Feb. 1958, 212(1), 15-17.

Determination of part of the liquidus curves for the nickel lead and chromium lead systems.

---

30 REACTION EQUILIBRIA BETWEEN MOLTEN LEAD AND METAL OXIDES — *E. Pelzel*

Erzmetall, Feb. 1958, 11(2), 56-63.

Investigation of equilibria between metal and oxide in lead arsenic and lead antimony systems.

(in German)

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31 ACOUSTIC EFFECT IN PHASE TRANSFORMATION IN THE LEAD-TIN SYSTEM — *H. Borchers and J. Kaiser*

Z. Metallkunde, Feb. 1958, 49(2), 96-101.

Determination of equilibrium diagram from noises produced during phase transformations. Particularly useful for solid state phase boundaries.

(in German)

32 MICROGRAPHIC INVESTIGATION OF PRECIPITATION (of Sn) IN Pb-Sn ALLOYS — *D. Turnball and H. N. Treafts*

Trans. A.I.M.E., Feb. 1958, 212(1), 33-39.

---

33 THE CONSTITUTION OF THE SYSTEM INDIUM-THALLIUM-LEAD, WITH REFERENCE TO STRUCTURAL TRANSFORMATION — *G. V. Raynor and J. Graham*

Trans. Faraday Soc., Feb. 1958, 54(2), 161-173.

X-ray diffraction and metallographic investigation of various alloys. Includes phase diagram for ternary system and discussion of previous work in binary systems.

---

34 OXYGEN AS AN IMPURITY IN HIGH PURITY LEAD — *R. C. Gifkins*

Acta Metallurgica, Feb. 1958, 6(2), 132-133.

Creep tests on leads of various purities. Vacuum casting and air casting of hydrogen-reduced high purity leads compared.

---

35 (1) GRAIN GROWTH IN ZONE-REFINED LEAD (2) SOME EFFECTS OF IMPURITIES ON GRAIN GROWTH IN ZONE-REFINED LEAD — *G. E. Bolling and W. C. Winegard*

Acta Metallurgica, April 1958, 6(4), 283-287, 288-292.

Growth law and activation energy and experiments over the range 168 to 318° C. Small additions of tin, silver and gold investigated.

PAINTS

36 PAINTING OF NON-FERROUS METALS — *K. A. van Oeteren-Panhäuser*

Metalloberfläche, Feb. 1958, 12(2), 53-56.

Pre-treatments, paint compositions and undercoats for various non-ferrous metals including lead.

(in German)

REFINING

37 BETTERMENTS IN THE QUALITY OF REFINED LEAD — *J. S. Jacobi and B. H. Wadie*

Bull. Inst. Min. Met., May 1958, No. 618, pp. 411-424; Trans. Inst. Min. Met., May 1958, 67(8), 411-424.

Discussion of earlier paper from same sources.

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38 MOLTEN METALS AND ALLOYS AS MEDIA FOR HEATING STEEL ARTICLES DURING HEAT TREATMENT — *A. P. Garashchenko, A. P. Gulyaev and Z. S. Luneva*

Metallovedenie i Obrabotka Metallov, Jan. 1958, No. 1, pp. 21-26.

Investigations include molten lead. Weight-loss of steels at 700-850° C. is given.

(in Russian)

---

39 VACUUM DEZINCING OF LEAD — *E. E. Lukashenko*

Tsvetnye Metally, March 1957, 30(3), 12-22.

A review of published information on vacuum dezincing of lead.

(in Russian)

SMELTING

40 THERMODYNAMIC ASPECTS OF CHEMICAL REACTIONS AS APPLIED TO THE SMELTING AND REFINING OF LEAD — *A. B. Chatterjea and B. R. Nijhawan*

Non-Ferrous Metal Industry in India: Symposium, Feb. 1954.

Free energy calculations and free energy/temperature values for optimum working conditions for various lead compounds.

41 WASTE-HEAT UTILISATION IN METAL SMELTING

(1) W. Weise
(2) H. W. Fulda

1. ROTATING REVERBERATORIES AT THE BINSFELDHAMMER LEAD SMELTER

2. RECUPERATORS FOR GAS HEATED ALUMINIUM CASTING FURNACES

Erzmetall, May 1958, 11(5), 217-219, 219-221.

(in German)

SOLDER

42 EUROPEAN SOLDER DEVELOPMENTS

Product Engineering, June 23, 1958, 22(25), 97.

A review of European literature covering soft solders and some zinc and cadmium based alloys.

TYPE METALS

43 PRINTING METALS

Fry's Metal Foundries Ltd.

Book, 2nd edit. 1956, 87 pp.
Fry's Metal Foundries Ltd., Tandem Works, London, S.W.19.

Revision of 1936 edition. Simple and brief metallurgy of printing alloys.

PART II

PATENTS

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PATENTS

ALLOYS

44 BRITISH PATENT 794,968. "Ag-Pb ALLOY FOR CAVITATION EROSION RESISTANCE"

CLEVITE CORPORATION

(Retention of hardness and resistance to cavitation at engine operating temperatures by aircraft engine bearing materials of .15-.75% Pb.) Based on the fact that Ag-Pb 0.15-0.75% are more resistant to cavitation than alloys of 1% Pb, and retain their hardness. The alloys within the range last longer than those of the higher proportions. A layer of 0.008"-0.02" thickness of alloy is applied to a steel member of 0.05"-0.07" to form a typical bushing.

BATTERIES

45 BRITISH PATENT 795,910. "PRIMARY ELECTRIC CELL"

UNION CARBIDE CORPORATION

The cell comprises a metal anode of Ag, Zn, Mg, Cu, Pb, Al or any metal less noble than Ag; a cathode collector of a metal other than that chosen for the anode; an electrolyte of solid ionically conductive silver halide; and a depolarizer formed from the oxide of a polyvalent metal in a higher valency state.

46 BRITISH PATENT 791,508. "MACHINE FOR POSITIONING STACKED BATTERY PLATE UNITS FOR BURNING OPERATIONS"

E. G. TIEGEL

47 AUSTRALIAN PATENT 31772/57. "ELECTRIC CURRENT PRODUCING CELL"

P. R. MALLORY & CO. LTD.

The cell is formed of an anode and a cathode of inert conducting material, and an electrolyte of lead sulfamate and sulfamic acid.

48 AUSTRALIAN PATENT 32211/57. "LEAD-ACID ELECTRIC ACCUMULATORS"

CHLORIDE BATTERIES LTD.

Tubular type plates for the accumulators are produced by weaving acid resisting filaments; placing the tubes on mandrels, and heating. The filaments then sinter together during crossover, giving the tubes, shrunken from the heating, a greater rigidity.

49 AUSTRALIAN PATENT 32233/57. "DRY-CHARGED BATTERY PLATES"

NATIONAL LEAD CO.

The negative plate is made by applying a reactive compound of lead to a supporting structure and then treating this with a reducing gas, so reducing the compound, at least in part, to metallic lead.

50 S. AFRICAN PATENT 3986/57. "ELECTRODE FOR STORAGE BATTERIES"

AKTIEBOLAGET TUDOR

Electrode contains vertical rods of conducting material, active material encasing the core, and an outer insulation of permeable electrolyte. An electrolyte resisting bar connects the two vertical rods.

51 GERMAN PATENT 1,031,849. "POROUS SINTERED STRUCTURE FOR ACCUMULATOR ELECTRODES"

H. VOGT

(Thickness of metal powder applied to a thin base determined by projections on surface.) The earlier method for making sintered structures was to apply the metal powder to a smooth base and sinter the powder, but now a rough surface having projections is used because of its greater adhesive properties. The projections decide the thickness of the coating. The perforated strip is passed through active material to a slot outlet where any excess is removed.

52 BELGIAN PATENT 564,582. "LEAD ALLOYS FOR ACCUMULATOR PLATES"

TUDOR A/B.

Cobalt and Silicon are added to lead alloys containing antimony. The corrosion rate is thereby reduced, because the peroxide layer has greater adhesion.

CABLES

53 BRITISH PATENT 797,936. "EXTRUSION PRESS"

UNTERNEHMUNGEN DER EISEN-U-STAHLINDUSTRIE

(Cable sheathing method.) The press has a receiver and press head of adjustable parts, and a grooved section, which will extend to provide a means of air release when the billet is compressed.

COATINGS

54 BRITISH PATENT 797,644. "LEAD DIOXIDE ELECTRODES"

PENNSYLVANIA SALT MANUFACTURING CO.

Lead dioxide electrodes are often employed in the production of certain chemicals by electrolysis (e.g. persalts). A difficulty has been to make a satisfactory electrical connection with the lead dioxide. The invention is based on the discovery that metal more noble than lead will make a good low resistance connector. In particular, silver is sprayed on to PbO_2 followed by copper to give a thick protective layer over the silver. Electrical connection is then made to the copper by any conventional method.

CORROSION

55 BELGIAN PATENT 564,284. "IMPROVING THE CORROSION RESISTANCE OF SOLDERED JOINTS"

AMERICAN CHEMICAL PAINT CO.

Pb/Sn soldered joints are treated with a solution of CrO_3 and a small amount of a mineral acid stronger than CrO_3. A suitable solution is 242.8g.CrO_3 and 74.94g.NaCl in one litre; dilute 20-30 vol. % with water for use. The joint is treated for 0.5-1.5 mins. at 21-27° C. Compositions of cleaning and make-up solutions are given.

ELECTROLYSIS

56 INDIAN PATENT 58712. "PURE LEAD FROM HIGH-ANTIMONY LEAD ALLOYS"

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

A mixture of boric acid, fluoboric acid, and lead fluoborate in a bitumen-lined cell is used as electrolyte, and during electrolysis the lead dissolves from the alloy-anode and deposits at the cathode.

ELECTROPLATING

57 BRITISH PATENT 797,805. "ELECTRODEPOSITION OF Zn"

WEAN ENGINEERING CO. INC.

(Pb, Ca and Sr compounds, silicofluoride and $ZnSO_4$ electrolyte for moving ferrous metal parts.) Zn is electroplated by passing electrolysing current from an anode to the basis metal through an electrolyte at 120° F. The electrolyte contains zinc sulphate, a Ca or Sr compound zinc silicofluoride, and a small amount of Pb. This process produces a bright coating at high current densities.

(See also No. 58)

58 BRITISH PATENT 797,806. "ELECTRODEPOSITION OF Zn"

WEAN ENGINEERING CO. INC.

Similar to No. 57 above, but with no Ca or Sr. For current densities of 800-1000 amps./sq. ft. the following electrolyte is successful: zinc sulphate 16 oz., zinc silicofluoride 0.2 oz., lead 0.001 oz. per U.S. gallon.

59 GERMAN PATENT 1,029,814. "CHROME PLATING SOLUTIONS"

UNION CARBIDE CORPORATION

(pH 1.0-2.25 for electrolytic removal of lead.) Lead is removed from sulphate solutions by adjusting the pH to 1.0-2.25, followed by electrolysis of 7.1 Ah per litre in one or more cells.

EQUIPMENT

60 S. AFRICAN PATENT 4237/57. "COOLING ARRANGEMENTS FOR MOLTEN LEAD"

METALLURGICAL PROCESSES LTD.

This consists of a trough for the lead, into which are dipped rotating, water-cooled drums, at a speed that will prevent the solid lead adhering to them.

GLASS

61 BRITISH PATENT 797,337. "MIXTURE FOR Pb-CONTAINING GLASSES"

PHILIPS N.V.

The bunker feeding of red lead powder is made easier by converting the red lead to granular form using water-glass binder.

ORES

62 GERMAN PATENT 1,029,761. "NON-SULPHIDIC ORE FLOTATION"

KLOCKNER-HUMBOLDT-DEUTZ.

(Use of C_{18} fatty alcohol sulphate and oleic acid as collecting-foaming agents.) The two agents, which must have no impurities, are employed in the flotation of oxidic and non-sulphidic ores. The alcohol sulphate improves distributing power while the acid is useful in the flotation of magnetite, fluorspar, apatite, haematite and chromi-iron ore.

REFINING

63 GERMAN PATENT 1,031,971. "SEPARATION OF LEAD-ZINC MIXED OXIDES"

UMTERHARZER BERG- UND HUTTENWERKE

(Evaporating of Pb in reducing atmosphere, after converting to sulphite.) First the mixed oxides are treated at below 1000° C. by a strongly reducing gas containing H_2S, then the lead (sulphite) is evaporated in a weakly reducing atmosphere above 1000° C. The principal item of the plant, which is described, is a rotating drum.

SMELTING

64 S. AFRICAN PATENT 4236/57. "CONDENSATION OF ZINC FROM METALLIC VAPOURS"

METALLURGICAL PROCESSES LTD.

A condenser is used with agitated molten zinc as the medium below which lead is circulated and then withdrawn for cooling. This, with any further zinc, is returned to the condenser, and zinc is finally retrieved from a quiescent zone of the condenser.

65 INDIAN PATENT 59191. "LEAD FROM MATERIALS CONTAINING LEAD SULFIDE"

METALLGES. A.G.

To produce lead, material containing lead sulfide is sintered in admixture with fly ash and recycled sinter, and heated.

66 GERMAN PATENT 1,031,523. "LEAD PRODUCTION"

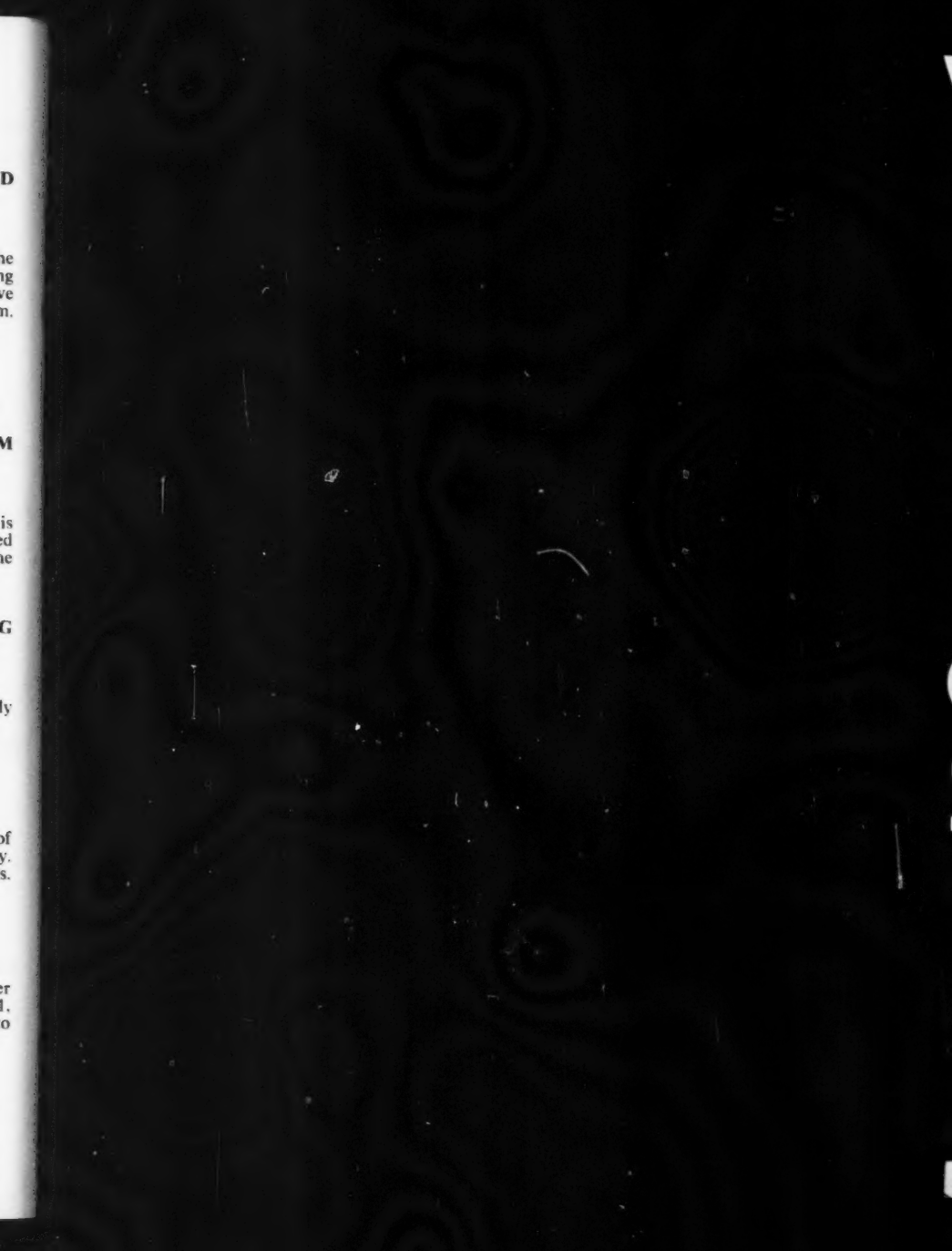
METALLGES. A.G.

(Method of roasting used in lead recovery.) Drawbacks of the normal practice of oxidising the lead concentrates are furnace corrosion and low thermal efficiency. These are counteracted with an internal heating of the sinter by inductive methods.

67 GERMAN PATENT 1,031,524. "SELF-FLUXING LEAD MELTS"

METALLGES. A.G.

(Smelting of sulphidic ores of adjusted ratio O:S.) The ores are sintered, after which the sinter is smelted at 1200-1250° C. In order to gain a ratio of 2:1, sulphidic material is added, together with a sinter of O:S ratio 1.90-1.95:1 to balance the excess oxygen.



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